Title: Dry Bean IPM on Farm Demonstrations 2017

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Cooperator(s): The two cooperating growers that participated in this project.

Abstract:
IPM practices in dry beans were demonstrated at three different fields on two farms this year. For each farm, data on pest levels, pesticide use, and damage at harvest were collected. Each field was scouted weekly for insect and disease pests. Disease samples were brought to Cornell's Plant Disease Diagnostic Clinic for identification. Growers received weekly scouting reports and treatment recommendations. At the end of the season a harvest evaluation was conducted. The overall EIQ (Environmental Impact Quotient) for each farm was also calculated. For all three fields the growers reported that having someone scout their dry beans was extremely helpful and that pests they were unaware of were identified and treated.

Background and justification:
New York produces approximately 200,000 cwt. (hundredweight) of edible dry beans on 9,600 acres for local, regional, and export markets (*The 2012 Census of Agriculture*). Growers apply numerous sprays of herbicides, fungicides and insecticides to control the different pests of dry beans. By using IPM procedures pesticide applications could potentially be reduced. Through on farm demonstrations growers can learn pest identification and threshold levels for the various pests. Knowing when a pest has reached threshold can help time sprays better and hopefully reduce the overall numbers of sprays required to control a pest.

Objectives:
1. Work with CCE field staff to identify farmers to host dry bean IPM demonstrations.
2. Interview growers to establish pre-season expectations
3. Begin weekly scouting of dry bean fields at participating farms. Provide growers with weekly scouting reports along with pest management recommendations.
4. Conduct harvest evaluations at time of harvest and post season interviews.

Procedures:
1. Two growers (3 total fields) participated in the demonstrations. One field was located in Steuben county and two fields were in Wyoming county approximately 15 miles apart.
2. All growers were interviewed prior to the start of the demonstrations to determine their typical pest management practices and pest damage levels.
3. After scouting fields, the scouting reports were emailed to the growers with recommendations on whether a spray application was necessary based on thresholds.
4. Harvest evaluations were conducted on each field by evaluating 10 pods on 10 plants at each of 10 locations for insect and disease damage. Post season interview questions were

sent to all participants to gauge their overall impressions of the demonstrations, their harvest, and to address any concerns they may have.

Scouting and Harvest Evaluation Results and Discussion:

Steuben County

The Steuben county site (Figure 1) consisted of an 11-acre field of Cruiser treated (insecticide and fungicide) red hawk kidney beans. The beans were planted on June 14th. This was later than usual, due to the wet spring. Adjacent to the dry beans was a hayfield and directly across the street was alfalfa and field corn.

During the initial interview the grower mentioned that his primary pest problems are white mold, Mexican bean beetles and potato leaf hoppers, especially in fields next to potatoes or oats. Western bean cutworm (WBC) has not been a major concern but the grower sprays when >100 cumulative moths are caught in nearby pheromone trap. In 2016, there was a major drought and he had problems with two-spotted spider mites, but these are usually not an issue for him.

A WBC trap was placed on May 24th and checked weekly until September 12th. The trap consisted of one commercial green bucket trap baited with a Trécé WBC pheromone lure to attract male moths and an insecticidal vaportape to kill moths once they entered the trap. The trap was hung ~4 feet from the ground directly next to the dry bean field and across the street from field corn. The pheromone lure was replaced every two weeks until the second week of September.

Weekly scouting began on June 27th, when beans had two unifoliate leaves, and scouting continued until September 19th, one week before harvest. The field in Steuben county had very low pest pressure. The main pests observed in the field as well as date of first detection are given in Table 1. Potato leaf hopper (PLH) and flea beetles (Figure 5) were detected on the same day. The beans were seed treated with Cruiser which protected the beans from PLH through the bloom stage. After bloom the PLH pressure never exceeded threshold to warrant a foliar spray. The flea beetles remained on the edge of the field, primarily coming in after the adjacent hay was harvested.

Bacterial brown spot (Figure 8) was detected on July 20th and confirmed on July 26th. Treatment with copper should begin at first sign of disease. The grower did not treat the field and the bacterial brown spot remained very low. White mold was observed on a single pod on September 12th. The grower sprayed the field at early bloom (7/27/17), prior to the onset of the disease (see Table 2).

Table 1. List of first detection of pests for the Steuben county site.

Pest	First detection	Threshold
Potato leaf hopper	7/11/17 (adults)	Only adults detected – Cruiser treated seed
Flea beetle	7/11/17	No threshold established

Western bean cutworm (trap)	7/11/17	None detected in field
Bacterial brown spot	7/20/17	7/26/17 – confirmed, begin treatment
White mold	9/12/17	Begin treatment at bloom

Table 2. Steuben county pesticide applications with EIQ.

Date	Product		AI	Rate	EIQ
6/15/17	Permit	Herbicide	Halosulfuron methyl 75%	.66oz/A	0.6
6/15/17	Parallel	Herbicide	Metolachlor 84.4%	1.6 pts/A	29.7
7/27/17	Sniper	Insecticide	Bifenthrin 25%	6 oz/A	4.2
7/27/17	Endura	Fungicide	Boscalid 70%	8 oz/A	9.3
9/17/17	Gramoxone	defoliant herbicide	Paraquat dichloride 30.1%	2 pts/A	14.9
TOTAL					**58.7**

Western bean cutworm trap catch peaked on August 1 at 16 moths. The cumulative trap catch of 48 moths never reached the 100 moth threshold to warrant scouting, though scouting for WBC was conducted weekly during the regular weekly scouting. Scouting should also be done 10 days after peak flight regardless of cumulative trap catch. No egg masses, larvae or damage from WBC were observed at this site.

On September 19th a harvest evaluation was conducted looking at 10 pods on 10 plants at 10 different sites for a total of 1,000 pods. Only one pod was found with white mold. Most of the pods had rusty spots but this was attributed to senescence and did not affect bean quality. Overall the harvest at this field was very good and the grower stated that yields were much better than 2016 and above average overall with about 38-40 bushels per acre.

Wyoming County

During the pre-season interview the grower indicated that his primary pests are potato leaf hoppers, especially after the second cutting of hay, Japanese and Mexican bean beetles, but these often come in late enough that they may not require a spray, and white mold. He stated that white mold is often seen in fields that received a lot of manure. Resulting in a thicker canopy and therefore reduced air movement. Weeds are always a problem specifically lamb's quarters, velvet leaf, pigweed, ragweed and nutsedge. He has not had a problem with WBC but will spray for them when trap catches reach a cumulative of 100 moths.

Organic Field

The organic field in Wyoming county (Figure 2) consisted of a 66-acre field of Montcalm, a dark red kidney bean. The beans were planted on June 9th. Adjacent to the dry beans was field corn and directly across the street was alfalfa.

A WBC trap was placed on June 12th and checked weekly until September 18th. The trap consisted of one green bucket trap baited with a WBC pheromone lure as described above for the Steuben county site.

Weekly scouting began on June 19th, at which point the beans had their first fully developed trifoliate leaf, and scouting continued until September 18th, one week before harvest. The primary pests observed in the organic field as well as date of first detection are given in Table 3. Potato leaf hopper (PLH) were detected at the first scouting visit and were over threshold by the second visit on June 23rd. Since this was an organic field and the seed was not treated the grower sprayed the insecticide Pyganic (Table 4). The following week, July 3rd, leaf hoppers were still above threshold so a second spray of Pyganic was applied after which the numbers remained below threshold for the remainder of the season.

Bacterial brown spot was detected on July 10th but not confirmed until July 26th. A fungicide/bactericide application was made on July 19th at the time of bloom and a fungicide application on July 22nd. In addition to bacterial brown spot, bacterial blight and white mold (Figure 7) were also detected in the field.
Japanese beetles and Mexican bean beetles arrived later in the season with damage patchy throughout the field.

Table 3. List of first detection of pests for the organic site in Wyoming county.

Pest	First detection	Threshold
Potato leaf hopper	6/19/17	6/23/17- threshold met
Bacterial brown spot	7/10/17	7/26/17 – confirmed, begin treatment
Bacterial blight	7/19/17	7/26/17 – confirmed, begin treatment
Snails/slugs	7/19/17	No threshold established
Japanese beetle	7/31/17	No threshold established
Mexican bean beetle	8/14/17	No threshold established
White mold	9/21/17	Begin treatment at bloom

Table 4. Wyoming county, organic field, pesticide applications with EIQ.

Date	Product		AI	Rate	EIQ
6/28/17	Pyganic EC 5.0	Insecticide	Pyrethrins 5.0%	10 fl oz/A	1.2
7/4/17	Pyganic EC 5.0	Insecticide	Pyrethrins 5.0%	10 fl oz/A	1.2
7/11/17	Pyganic EC 5.0	Insecticide	Pyrethrins 5.0%	10 fl oz/A	1.2
7/19/17	Double Nickle LC	biofungicide/ bactericide	*Bacillus amyloliquefaciens* strain D747 98.8%	2 qt/A	Not available
7/22/17	Serenade ASO	Fungicide	Bacillus subtilis strain QST 713 1.34%	4 qt/A	1.34

TOTAL	Cannot determine

Western bean cutworm trap catch peaked on August 7th at 103 moths. The cumulative trap catch for this site reached 269 moths. Scouting adjacent corn for WBC began on August 7th and continued for the remainder of the season. No egg masses, larvae or damage from WBC were observed in the adjacent corn. On August 28th one pod was found in the field with possible WBC damage (Figure 10).

Weeds were a problem throughout the season. The primary weeds identified were: prickly lettuce (Figure 4), mustard, pigweed, velvetleaf, and bindweed. Hand weeding began on August 14th and continued for three weeks. Unfortunately, weeds were left in the field between rows and seemed to have contributed to the incidence of white mold. A harvest evaluation was conducted on September 18th looking at 10 pods on 10 plants at 10 different sites for a total of 1,000 pods. Of the 1000 pods 33 were found with white mold. The incidence of white mold anecdotally seemed to be greatest near areas where the weeds were left, with infected pods often touching the culled weeds. Overall the harvest at this field was good and the grower stated that yields were slightly above average. He attributed this to the intensive weeding and the favorable weather at harvest.

Conventional Field

The conventional field in Wyoming Co consisted of a 33-acre field of Cruiser treated (insecticide and fungicide) cranberry and light red kidney beans. The beans were planted on June 23rd, later than usual do to the wet spring conditions (see Figure 3 for field conditions 3 days after planting). The field was surrounded by woods on three sides and a hedge row on the forth side. On the other side of the hedge row was another field of conventional dry beans.

A WBC trap was placed on June 12th and checked weekly until September 18th. The trap consisted of one green bucket trap baited with a WBC pheromone lure as described above for the Steuben county site.

Weekly scouting began on July 3rd, at which point the beans were in the crook stage (hypocotyl emergence). Scouting continued until September 25th, about one week before harvest. The primary pests observed in this field as well as date of first detection are given in Table 5. Adult potato leaf hoppers (PLH) were detected during the second scouting visit. Treatment is only recommended for Cruiser treated seeds once nymphs are observed and usually after bloom when pressure increases, but threshold for PLH was never met at this field. Bacterial brown spot was detected on July 19th but not confirmed until July 26th. Treatment, with a copper product, should begin at the first sign of infection, but none were made. In addition to the bacterial brown spot, bacterial blight and halo blight (Figure 9) were also confirmed in this field.

White mold was never detected in the field, but the grower applied a preventative fungicide at early bloom (Table 6). Snails and slugs were a problem near the edges of the field. The field is surrounded by woods and the edges are often shaded, this is where the greatest snail and slug feeding occurred (Figure 6). Damage was only seen on the leaves and did not affect the bean pods.

Both Japanese beetles and flea beetles were also present in this field, but numbers were low and did not cause any economic damage to the crop.

Table 5. List of first detection of pests for the Wyoming county conventional site.

Pest	First detection	Threshold
Potato leaf hopper	7/10/17 (adults)	Only adults detected – Cruiser treated seed
Bacterial brown spot	7/19/17	7/26/17 – confirmed, begin treatment
Bacterial blight	7/19/17	7/26/17 – confirmed, begin treatment
Snails/slugs	7/19/17	No threshold established
Flea beetle	7/25/17	No threshold established
Japanese beetle	7/25/17	No threshold established
Halo blight	8/21/17	8/28/17 – confirmed, begin treatment

Table 6. Wyoming county (conventional site) pesticide applications with EIQ.

Date	Product		AI	Rate	EIQ
5/15/17	Abundit edge	burndown herbicide	Glyphosate N-(phosphonomethyl) glycine 48.7%	24 fl oz/A	11.2
6/23/17	Dual II Magnum	herbicide	S-metolachlor 82.4%	12 fl oz/A	7.7
6/23/17	Permit	herbicide	Halosulfuron methyl 75%	.66oz/A	0.6
7/31/17	Grizzly Too	insecticide	Lambda-Cyhalothrin 22.8%	1.92 fl oz/A	1.2
7/31/17	Proline 480 SC	fungicide	Prothioconazole 41%	5.7 fl oz/A	4.6
9/20/17	Abundit edge	herbicide	Glyphosate N-(phosphonomethyl) glycine 48.7%	24 fl oz/A	11.2
9/20/17	Gramoxone	Defoliant herbicide	Paraquat dichloride 30.1%	32 fl oz/A	14.9
TOTAL					**51.4**

Western bean cutworm trap catch peaked on August 1st at 12 moths, with a cumulative trap catch of 36 moths. The trap was placed near the hedge row that separated this dry bean field from the other one mentioned in the field description. This is not ideal trap placement. Traps should be placed away from any obstruction that could impede movement of the pheromone. Fortunately, another trap was placed at the other side of the field, approximately 950 feet away from the first trap. The second trap was placed in with the dry beans and saw a much higher trap catch. It peaked on the same week as the first trap but had 61 moths as compared to 12 moths. It had a

cumulative trap catch of 238 moths. Scouting should be done 10 days after peak flight regardless of cumulative trap catch. No egg masses, larvae or damage from WBC were observed at this site.

On September 18th a harvest evaluation was conducted looking at 10 pods on 10 plants at 10 different sites for a total of 1,000 pods. No damage was seen on any of the pods at harvest. Two pods were observed with the same rusty spots as the Steuben county site but was attributed to senescence and did not affect bean quality. Overall the harvest at this field was excellent and the grower stated that yields were slightly above average.

Project location(s): Steuben county and Wyoming county, NY

Figure1. Steuben county field June 20, 2017, one week after planting.

Figure 2. Wyoming county organic field June 12, 2017, three days after planting.

Figure 3. Wyoming county conventional field June 26, 2017, three days after planting.

Figure 4. Prickly lettuce next to dry beans.

Figure 5. Flea beetles and feeding damage on dry beans.

Figure 6. Snail/slug feeding damage.

Figure 7. White mold

Figure 8. Bacterial brown spot

Figure 9. Halo blight

Figure 10. Possible Western bean cutworm feeding